

Wilkinson (J.)

FOR THE CENTENNIAL.

HOW TO CONSTRUCT A PERFECT DAIRY ROOM, ILLUSTRATED;

AND A BRIEF HISTORY OF THE

DAIRY ROOMS AND CREAMERIES OF THE UNITED STATES,

EMBRACING AN ILLUSTRATED DESCRIPTION OF THE DETAILS OF THE
CONSTRUCTION OF

THE GULF STREAM REFRIGERATED DAIRY ROOM,

AND OF THE ACTION OF THE NATURAL LAWS CONTROLLING THE CIRCULATION
OF THE AIR AND WATER USED IN COOLING AND VENTILATING IT;

BY THE INVENTOR AND PATENTEE,

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and on DAIRY ROOMS AND DAIRY FARMING; Superintendent of the Agricultural
Building on the Centennial Exhibition Grounds, and Associate Editor of
the "Maryland Farmer," published by E. WHITMAN, ESQ., Baltimore, Md.*

PERFECT BUTTER is the most rare of all manufactured Agricultural Products; it requires
great experience, intelligence, skill and care in its manipulation, and withal a Dairy Room in
which the air is kept dry, pure and cool and is constantly changing

B-55

PRICE 25 CENTS.

THIS TREATISE IS RESPECTFULLY DEDICATED TO

Professor L. B. ARNOLD, Secretary,

"AMERICAN DAIRYMEN'S ASSOCIATION,"

IN APPRECIATION OF HIS PRAISEWORTHY AND SUCCESSFUL EFFORTS
IN ELEVATING THE DAIRY INDUSTRY OF THIS
COUNTRY TO ITS PRESENT STATUS.

HOW TO CONSTRUCT A PERFECT DAIRY ROOM

DAIRY-ROOMS AND CREAMERIES.

The dairy industry of this country is suffering seriously for the want of a system of construction of *dairy-rooms* that will reliably provide the essentials in such structures, viz: *a proper and uniform temperature, a constant change of the atmosphere in the dairy, and the removal of all dust and noxious gases from that admitted to it; also to dry it to that degree that it is unfavorable to the formation of mould and fungoid growth, so injurious to milk and its products.* These characteristics have never been fully attained by dairymen, or their builders who have constructed the dairies in general use. To accomplish what is needed involves a thorough knowledge of the complex arts of cooling and ventilation, of which the builders of dairies in this country possess but a very imperfect knowledge, if any. Whilst the science of architecture as applied to public buildings, churches, the better class of residences, &c., in this country, has reached a very creditable status among the arts and sciences, the encouragement extended to the strictly rural architect has been so limited that there are but two or three in this vast nation, and they are obliged to practise the art in conjunction with others better appreciated. All but the few to whom I have alluded, who have embarked in the practice of strictly rural architecture, have been obliged to abandon it for want of patronage. Had only a moderate degree of patronage been extended by farmers to the architects who have attempted to make farm struc-

tures a specialty, their necessities would have soon been understood, and their wants would have been supplied in a character of buildings much better adapted than they (the farmer and the country carpenter) could design and construct.

No man in America knows more nearly the true status of the farmer in this respect, than the writer. Forty-one years have elapsed since he designed and made plans for a suite of farm buildings; and a constant practice in rural architecture, which he has made a specialty ever since, never building one church, warehouse or city dwelling in that period; and having built in eleven different States, and over a wide range of latitude, and every variety of building required in the country, using every description of building material, has given him an extraordinary opportunity to observe the defects in the structures in general use, and to realize the necessity for improvement in the comfort, economy and convenience, and in the external appearance of such buildings. He has often found it practicable to secure in a good degree each and all of these desirable qualities in a building, without exceeding the cost the proprietor purposed to invest in a building very inferior in these essentials.

By effecting such results, numerous examples of which he could cite, he has gradually educated a goodly number of farmers to see that it is to their interest to employ the most competent architect obtainable, even if the building to be erected be nothing but a sty or a kennel.

The intelligent, experienced architect has a knowledge of the relative strength and durability of all material to be used in his field of practice, and hence will only use the requisite amount in all cases; whilst the novice often wastes material, and, by the use of an insufficiency in important parts of the structure, and an excess in others, the value and usefulness of the building is often impaired to an amount far exceeding that which a good architect would charge for plans, &c.

I have dwelt thus on this branch of the subject, in consequence of the belief, honestly entertained, that I cannot lay before the class of readers for whom this matter is written, that which will be more useful.

THE IMPROVED DAIRY ROOM.

I feel that I cannot present a more striking example of the truth of what I have endeavored to impress in the foregoing, than by comparing the results of an architect's efforts, with those attained by dairymen, aided by the country carpenter and stonemason, in designing and constructing dairy houses.

We will endeavor to fairly compare the new and improved, with the best of various descriptions that have been repeated, with unimportant modifications, from one end of the country to the other, and from the earliest day that the manufacture of dairy products in this country was attempted. In the northern portion of the dairy belt of the U. S. farm-house cellars are generally used for butter-making in the fervid season ; and when the manufacture of butter is extended into the cold season, a room above ground is used, in which a proper, or some degree of artificial heat may be provided.

A closet, or pantry, opening to the farmhouse kitchen is often used, and not unfrequently the kitchen is the winter dairy room, with all the odors of the cook-stove, the breaths and other exhalations of the family, young and old, the old boots from the stable or farm-yard, and very commonly dogs and cats in the same room.

All this I have seen ; and the milk was placed on a movable table, and covered with boards to protect it from cats and dogs, and when the family retired the table was moved near the stove, where the draft of combustion tended to draw the impure air over the milk, which, not being covered closely, would seize and fix the noxious odors, thus scenting and flavoring it until no one could decide what the odor or flavor of the milk or cream was ; they could only say that it was intolerably fetid, and tasted like a mixture of bad flavors.

Such a place for storing one of the most sensitive of all known substances used for human food is, to say the least of it, quite unfit. The cellars used in summer are many of them little better. The floor, on which the milk is usually placed in order to secure the lowest temperature, is usually several feet below all openings by which the apartment may be ventilated. The ground will cool the air in the cellar, and so increase its density that the same

stratum of it often lies near the floor, and over and around the milk for months, nearly unchanged in its condition, except that twice every day a quantity of new milk, fully charged with animal odors, supplies the place of that removed; and not infrequently additional unmentionable substances are taken into the cellar, adhering to milker's feet-coverings; and more than once have I seen the meat barrels, decaying vegetables, soap, and wash tubs, and even the sauer kraut barrel, in the milk cellar. Even if none of the articles named had been stored contiguous to the milk, such a cellar cannot be ventilated, and the air in it kept in a suitable condition for milk storage, or even approximately so, by any but the three processes that I shall describe. In the use of a blower, or an air-pump, the heavy, fetid air might be removed, and fresh, warmer air substituted.

To this there are two serious objections, viz. both the fan and the pump would require power, which could not be afforded; and the warm air introduced would produce a temperature so high as to be fatal, hence neither are practicable. A ventilating, close exhaust-pipe might be extended from near the floor of the cellar into, and a good height up the chimney-flue to which the summer cook-stove discharged, and thus, by vacuum, the cool air may be drawn out of the cellar; but there being no source of supply other than the out-of-door atmosphere, which is generally too warm, this would not do. The other which I shall describe has the same defect last named, though it may be made to effectually and constantly change the air in the cellar in warm weather. It is simply laying an air-duct, with a continuous fall in it, so located that the end remote from the building will discharge on the surface of the ground, and a proper length of it laid below solar influence, thus draining out the air the same as water is drained off. This will constantly exhaust the coolest air from the cellar; and the only source of supply being the warm air from without, this too would be fatal.

There are, however, in high latitudes locations that are high, bleak and airy, where milk may be set in the house cellar, properly cleansed and kept, and the cream may mainly be taken from it in a condition to make tolerable butter, but not the best; and at

times when the air is most highly charged with electricity, the milk will sour before the cream has risen.

In lower latitudes, spring-houses are very generally used where it is practicable. This system of keeping milk for butter-making has also numerous objectionable characteristics, and of late many springs which were considered perennial have utterly failed, and the spring-houses have been abandoned. The best of them have the defects that I shall describe.

They are generally located remote from the farm-house, for the reason that the springs which are durable and cool are usually at the base of a hill, and on the margin of low land, and necessarily much lower than the dwelling. This of course necessitates the constant ascent and descent of the hill in carrying the milk to and from the dairy, and in the care of it. Dairy work usually devolves on the females of the household, who are exposed to extremes of temperature and storms in going to and from the spring-house, and they are often compelled to leave the heated air of a cook or wash-room and expose themselves to the sudden transition from it to that of the damp, cool spring-house, in which they are frequently compelled to remain to perform dairy work until they are chilled, and in that condition must return to the highly heated apartment, than which no condition or alternation of temperature could well be more unhygienic; and as a natural consequence, many have contracted, through such injudicious exposure, fatal maladies. This alone is sufficient to condemn these relics of semi-barbarism to disuse, and call loudly for a more healthful substitute; and so it has in numerous instances, and the call was heard; but in the absence of the light of science, no one was able to supply a substitute that embraces the essentials of a proper dairy-room. Hence thousands of these inconvenient, unwholesome and otherwise unfit places for keeping milk are still, and will long continue to be used.

Before I dismiss the consideration of the spring-house, I feel that I would be guilty of a criminal omission were I not to speak of another, and perhaps the most serious objection to it of all. I refer to a peculiarity of spring-house sites usually favorable for collecting and holding contiguous to the milk and butter, the

malarial gases that are always found in a greater or lesser degree in low bottoms. It is well known that milk has a great affinity for such gases, and hence, when charged with them, it becomes a most effective means of introducing them into the human system, and of disseminating the dread maladies they produce. I might add several other strong objections to this class of dairies, but if these do not suffice to condemn them, and induce all dairymen to abandon them and adopt the best substitute obtainable, no further exposé of their defects will.

Another style of dairy room quite common in some localities, is a room more or less below ground, and arranged with vats, or sinks for water, which is supplied by pumps, worked by a variety of power, drawing the water from wells; and in some instances flowing spring water is availed of. If the wells and springs do not fail partially, or entirely, a favorable temperature of the house, and of the milk, may often be attained. But for reasons already assigned, the dairy cannot be ventilated without sacrificing the desirable temperature of the air in it, hence they too are seriously defective; *for, if the dairy room lacks ventilation, it lacks the great essential, and is unfit for use.*

PROPER DAIRY VENTILATION.

Any system of ventilation that will not change the air in an apartment, without materially changing the temperature in it, is unfitted for dairy ventilation. This I accepted as an axiom, when I embarked in the work of dairy room perfection, many years since, and for a time I made but little progress. It would be interesting, and might be useful, if I had space to relate all that I did in experimenting, to ascertain how a dairy room might be constructed that could be kept at a proper temperature, and yet have the air in it constantly changing; but I have not; and as I profess to have achieved the object of my aim, I will proceed to describe what I claim to be the successful culmination of my protracted efforts, *a perfect dairy room.*

As it is universally claimed that everything should have a name, I decided to christen my perfected work with a name that prominent characteristics of it suggested, hence I called it the *Gulf*

Stream Refrigerated Dairy Room, on account of the similarity in the circulation of the water in it, to that in the ocean called the "Gulf Stream."

I reached the goal a little more than a year since ; and confidently believing that no one would soon invent a plan of dairy construction superior to mine, I applied for, and had granted me by the U. S. Government, two letters patent for my invention. During the past year a very limited number had confidence enough in my invention to build dairies after my system. Wm. S. Taylor, of Burlington, N. J., erected one in the autumn of 1874, and has used it since. John P. Sager, of Lenape Mills, Chester Co., Pa., completed another last spring, which has also been thoroughly tested ; and these gentlemen both pronounce high encomiums on their dairies, and say that they are "perfectly satisfactory." (See their letters on another page.)

I should state that these dairy-rooms are both built after the Gulf Stream Refrigerated Dairy patent, with contiguous ice-houses, and with *subterranean ventilation* ; but Mr. Sager's dairy has the hot weather air supply pipe only, by which cooled air is brought into the dairy through an underground duct, by natural flow, and the egress is by the way of small openings around the door and windows ; whilst Mr. Taylor's dairy has both ascending and descending ducts, which alternately become supply and exhaust, or ingress and egress, according to the out-of-door temperature. Mr. Taylor's dairy was intended for use both in summer and winter, or a perpetual dairy.

In May last I constructed and applied to a vault the subterranean ducts for supplying a dry vault with air, which had been used for years very unsatisfactorily, as milk and cream kept in it moulded, and both smelled and tasted badly. This dairy is on the farm of Joseph Coudon, Esq., near Perryville, Cecil Co., Md. After using it with the sub-earth ventilation for a season, he writes me that "*it has been very satisfactory.*" So it would appear that a dairy constructed strictly according to the Gulf Stream patent, using circulated, cooled air and water bath, satisfies Mr. Taylor, and, as he says, "*works like a charm summer and winter.*"

The single duct descending towards the dairy, Mr. Sager says,

"is a perfect success, and maintains a temperature of 60° in the dairy through the months of July and August, and does not vary a half a degree."

Mr. Coudon's dairy, with underground air-duets both above and below it, and no ice, and no water-bath in which to set the milk, *"is perfectly satisfactory."* It would appear that the sub-earth air-duets alone, independent of the influence of the ice-house, and the Gulf Stream circulation of water, has given the party using them as satisfactory results as the additional cooling power has the other gentlemen. Hence we may conclude that the underground ventilation is the essential requisite of a good dairy, provided the ducts are the only means of ingress and egress of air. (See what Prof. Arnold says of the sub-earth ventilation on another page.)

The ducts in use in Mr. Coudon's vault are each a six-inch pipe, laid at a depth of five feet below the surface of the ground, one having a fall towards the dairy of some seven feet in one hundred, the other a fall from it of some two and one-half feet in one hundred feet. The ducts are each one hundred feet in length, and are each open at either end at all times. The circulation is downward through the ducts and dairy in hot weather, and upward in cool; and air is supplied to the dairy at about the same temperature summer and winter, with a constant change; and I believe that the temperature of 60° is about the mean. Sufficient light should be admitted for convenience in manipulating the milk and its products, but the sun should not shine directly on the milk or cream.

My protracted experience has established the conviction that the temperature of the earth below solar influence, or about 60°, is most favorable for setting and manipulating milk in butter-making, and I am indorsed in the opinion by several of the most intelligent dairymen in the country.

If we are correct, it would appear that my new system of ventilation, by which I secure the temperature of the ground, and give it to the air taken into the dairy room, is about all that is requisite in butter-making; but the system has other characteristics that are invaluable, which it would appear to be impossible to secure in so great a degree, and so entirely natural in their origin and automatic in

their action, through any other means known to the best areometrician of the present age.

DESIRABLE CONDITIONS OR CHARACTERISTICS OF THE DAIRY ROOM.

Every intelligent dairyman knows that it is desirable to remove excessive humidity, and all dust and offensive or noxious odors that may exist in the air that is to be admitted into a dairy room. Neither of these desiderata have ever been attained, until it was accomplished in the use of the subterranean ventilation. But, with its use, the desirable conditions in air for the dairy are not only attainable, but they are absolutely unavoidable, and are the natural and automatic results of the use of this unique and invaluable discovery.

THE HUMIDITY CORRECTED.

The duct and the earth in which it lies, being cooler, in summer, than the air as it enters it, the vapor in the air is condensed on the interior surface of the duct, and the air is sufficiently anhydrous before it enters the dairy. Thus one point is gained; and another result simultaneously attained, is that of removing all dust that may be floating in the air; pollen from the flowers of plants, and the like, are effectually removed by contact with the moist surface of the interior of the duct, and conducted, with the water so formed, into drip wells for the purpose.

THE NEW FORM OF DUCT.

In order to secure the third desideratum, no less desirable or less important than those already described, the inventor has recently conceived an idea of making the duct of a new material, and so arranging it that the bottom shall consist of natural earth. It has long been well known that the earth has the power of absorbing noxious odors, is an effective deodorizer and disinfectant, and it is also known to remove the virus of the most contagious and fatal diseases (small-pox for example) from clothing and bedding used by patients who have suffered from the dread malady. Hence, a duct with an earth bottom supplies the third and last of the desiderata.

Most fortunately for those who may require, and decide to build

a dairy with sub-earth ventilation, the new duct, the characteristics of which have been described, is very much less expensive than that constructed of terra-cotta or glazed earthenware pipes, and is superior in its effects, and equally durable. It is formed by setting two lines of roofing slates in the bottom of a ditch in the form of a "double pitch" roof, resting the lower edge of each line of slates in the angle formed by the bottom and the side of the ditch, and resting the upper edge of each line one against the other, and returning the earth upon them. (See Fig. 2.) A six-inch

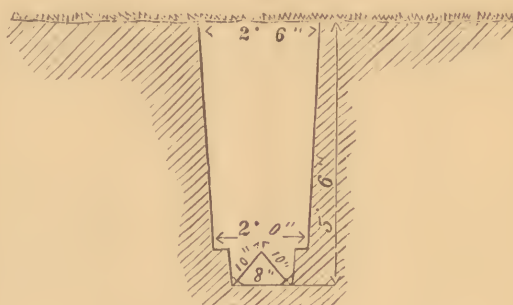


FIG. 1.

CROSS SECTION OF A DITCH WITH SECTION OF SLATE AIR-DUCT IN IT.

terra-cotta pipe, of which I have hitherto been constructing my subterranean air-ducts, costs, usually, about thirty cents per lineal foot, or \$60.00 for the 200 feet which I used in each dairy. As I considered the interior surface of such a duct less than is desirable, and the cost of it too great to adapt it to the means of the mass of dairymen, I set about the invention of a superior substitute that should cost less money, and I am happy to say with most gratifying success. The slate duct costs but about five cents per foot, or ten dollars for each dairy, thus making a saving of fifty dollars; and after paying for the patent-right \$20.00, and \$25.00 for plans and specifications for construction — total \$45.00 — a margin of five dollars remains of the sum saved by the use of the slate duct.

COST OF CONSTRUCTION.

Ordinarily, the excavation of the two hundred feet of ditch for

the ducts, for ventilating a dairy on this system, with the slate ducts and all else appertaining, independent of the building, should not cost to exceed forty-five dollars, which, with the cost of the right and the plans, will amount to about ninety dollars. The cost of the dairy room will, of course, be in proportion to the amount of milk to be stored; but for one large enough for the milk of twenty to twenty-five cows, it need not cost over about \$100.00, or about \$200.00 as the total cost of a dairy room with the subterranean ventilation. An additional cost of, say one dollar for each additional cow, up to one hundred, will be ample.

The above estimate is, however, for a dairy-room well constructed of stone or brick to the height of six feet, and frame above, and without ice-house, and without the Gulf Stream water-bath, or simply with the sub-earth ventilation. The additional cost for an ice-house, a cube of eighteen feet, which will suffice for a thirty-five cow dairy, may be \$200 more, making a total cost, ordinarily, of about \$400. These estimates are believed to be liberal.

I find, however, that the same structure, of the same material, costs one man even fifty per cent. more than another. I shall, in the early future, have agents in each district, who will be capable, economical mechanics, and who will be able to build at a minimum cost, and provide every essential in material and principle; but any builder of ordinary intelligence can build after my plans.

A dairy after the Gulf Stream patent, entire, has certainly advantages over one only having the sub-earth ventilation; but the ice-house costs as much or more than the dairy; and a dairy having the sub-earth ventilation only, having proved so satisfactory, and most dairymen being compelled to economize, there will be more built without the ice-house than with, especially as the ice-house can be appended to the dairy at any time.

I have of late furnished several plans for constructing a dairy room of a portion of the farmhouse cellar, which is often practicable; and when it is so, no site for it could be more convenient. The ventilating apparatus for a dairy in the house-cellar may also be made to ventilate the house as well, often very desirable.

WATER FOR THE DAIRY ROOM.

A well arranged rain-water cistern of proper dimensions for collecting and preserving the water from the roofs of ice-house and dairy, will afford an ample supply of the best water for use in and about the dairy.

EXCESSIVE USE OF WATER.

Water should not be used in excess about the dairy room, as the humidity it occasions is injurious.

STEAM FOR CLEANSING.

A small steam generator is very desirable in the scullery, or the apartment in which the milk vessels are cleansed. Steam is more penetrating, hence more effective, than hot water for cleansing, and with proper arrangements is much more convenient. There is an abundant rainfall in all good dairy districts to supply all water needed in and about a dairy from its roof.

SITES FOR DAIRY ROOMS.

In the selection of a site for the dairy, I shall lay down certain rules, which should be observed as far as is practicable in every case. There are, however, a great variety of local characteristics on dairy farms, which require modifications of said rules, that can be best accomplished by the experienced rural architect; and as the proper construction of the dairy house is second in importance to no other in a suite of farm buildings, it will be found profitable, as I have previously urged, for the dairyman to call to his aid the best talent and the greatest experience obtainable.

DRAINAGE.

The first essential in a site for any rural structure, but especially for the dairy, is good drainage, either natural or artificial. A wet site will produce a humid atmosphere, which, with the heat of the fervid season, supplies the two essential atmospheric conditions most favorable to the production of mould, mildew, fungoid growth and malaria, all of which are concomitant features of an improperly drained site.

Some sites are by nature better than others can possibly be made artificially. I have, however, by skilful underdraining and deep tillage of a sufficient area around a site that was utterly unfit for use, produced a degree of aridity in the soil, and dryness and purity in the atmosphere of the improved site, that equally delighted and surprised the proprietor, and really secured a condition that would satisfy the most fastidious. Such successes warrant me in adhering to the rule long since adopted, of placing the dairy room where it will be most convenient, and artificially correcting natural defects in the site. This, of course, involves the exercise of a good degree of skill and judgment, derivable only from their true parent, experience.

I am forcibly impressed with the truth of the above by a case in hand. I recently received an order to remodel one of the most expensive dairy-rooms in the country, which for want of the essentials that I have claimed are required in a dairy, has proved so defective that, in the critical season, no degree of skill and care can produce good butter. I have visited the patient and diagnosed the case, and was able to guarantee a cure by an expenditure of a sum so nominal that the increased market value of the butter made in a season will more than liquidate all the cost.

I have also in progress at this writing the remodelling of a dairy-room in this county (Baltimore, Md.), which cost over \$2000.00 some twenty years since, and has been abandoned on account of its defectiveness; which, had I constructed it, would not have cost over \$400, and would have been profitable, whilst that built has now cost, counting the interest, over \$8000.00.

I might cite numerous similar instances of less magnitude, that have occurred in my professional experience, substantiating the premises taken, that it is economy to employ the best architect obtainable if a building is needed. Until farmers learn this, they will continue to waste money on the buildings they erect, and will not secure the comforts and conveniences readily supplied by skill and experience.

ASPECT OF THE DAIRY SITE.

The importance of the hygienic influence of the full power of

the sun on the dairy site is no more understood, or appreciated by dairymen generally, than are other essentials. Many dairies to which I have been called, with the hope that I could remove the cause of the destructiveness of mould and attendant bad odors in them, I have rendered perfectly satisfactory, by removing shade-trees, supplying cave-troughs, and conducting water from them and the surface of the ground immediately around the building to a proper place of discharge, and properly ventilating the building.

SUBTERRANEAN VENTILATION A BOON.

In the use of the sub-earth ventilation, and with proper construction, we are able to defy the power of old Sol in his evil influences on the dairy, hitherto so fatal. The extent to which solar heat can penetrate the earth is limited by the continual action of that natural law which renders rarified fluids more buoyant. The direct action of the sun on the surface of the earth, in this latitude, is confined to less than an average of two-fifths of each twenty-four hours during the hot season; and during the greater period that the earth is giving off heat, its penetration rarely exceeds a greater depth than five feet. With this fact to guide us, we only need to avail of the temperature of the earth below solar influence, and the law of gravitation, as reliable and changeless as its divine Author, and with the proper arrangement of air-ducts, we have the earth's temperature imparted to the air admitted to the dairy, and this, fortunately, is the proper temperature.

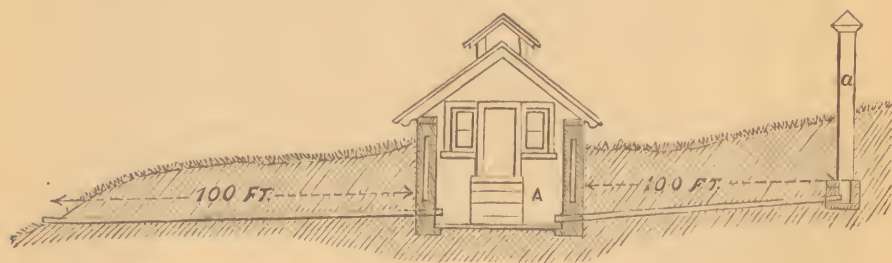


FIG. 2.

SECTION OF A SITE FOR, AND OF A DAIRY ROOM, WITH SUB-EARTH VENTILATING DUCTS.

A SECTION OF A DAIRY ROOM AND ITS SITE, WITH THE SUB-EARTH DUCTS.

Fig. 2 shows the arrangement of the ducts in the ground, both above and below the dairy-room. As previously explained, the course of the air is downward through the ducts and the dairy in hot weather, and upward in cool weather. The movement of the air being solely dependent on the temperature of it as compared with the external air, it does not circulate until it is influenced by the temperature of the earth; and the movement is very gentle, but sufficient to keep up a perpetual change of the air, and a pure and cool temperature in the dairy. This is sufficient, as it is unlike an audience room, there being no consumption or sensible vitiation of the air.

Kind reader, your criticism of the system of cooling and ventilating the dairy as described is greatly desired by the inventor of it, as the weal of the dairyman may be thereby promoted.

EXTRACTS FROM LETTERS

OF PARTIES USING THE

GULF STREAM REFRIGERATED DAIRY ROOM,

ALSO FROM

Those using, and from others who have seen in use, Dairy Rooms in which the Subterranean Ventilation is alone used; i. e., without either "Ice," or "Water," for cooling.

LENAPE MILLS, CHESTER CO., PA., Oct. 27th, 1875.

PROF. J. WILKINSON:

Dear Sir:— Having had a full season's experience with your patent "Gulf Stream Refrigerated Dairy Room," I write to say that it has proved a perfect success.

We have never made butter with such satisfaction, as since we have been using your Dairy Room. We have no trouble in keeping the milk, raising the cream, or in making good butter. The mercury stood at 60° in our dairy all through the months of July

and August, and did not vary a half a degree. We have never had occasion to use the cold air flue, lying in the cold ice-chamber under ice-house.

Your underground ventilation is certainly a capital thing. I never saw a dairy room before where the temperature could be kept during the "dog days," at just right; we think that 60° is right, for we can churn and work the butter at that with entire satisfaction.

Respectfully yours,

JOHN P. SAGER.

THE ELMS STOCK FARM, BURLINGTON, N. J., 12th mo. 25th.

PROF. J. WILKINSON, *Baltimore, Md.*

Dear Sir :-- I have now been running your patent Gulf Stream Refrigerated Dairy Room about thirteen months. I keep a perpetual dairy, as my customers desire me to supply them with butter throughout the year.

The Dairy works equally well at all seasons; the temperature runs very uniform, and is about 62° , as the ground in which the air-ducts lie is not affected by either sun or frost. I consider your subterranean ventilation an invaluable invention; and when dairy-men once know its great value, they will not be slow to adopt it, as it is one of the few things which they cannot afford to do without. The Dairy world is certainly greatly indebted to you. We have never had any sour milk in our dairy, which characteristic I have thought would be very valuable to creamery men, who desire to make both butter and cheese.

We still have plenty of ice; the Gulf Stream cold water bath does not consume ice as rapidly as I feared it would; in fact, we have more ice than usually at this season. Our dairy is altogether a success.

Yours very truly,

WM. S. TAYLOR.

OFFICE OF THE AMERICAN DAIRYMEN'S ASSOCIATION,

Rochester, N. Y., Dec. 20, 1875.

PROF. J. WILKINSON.

Dear Sir :--Yours of the 19th received. I have examined your Improved Subterranean Duct for ventilating and cooling the air in dairy rooms, and am free to say I regard it as a sensible and feasible device. The air, in passing through this duct, can never

fail to fall to the temperature of the earth in which it is imbedded; nor can it fail to be entirely freed from vapor, dust, and odors, by reason both of contact with the earth, and of condensation from its reduced temperature. I like your duct for another reason: it allows of cooling milk with *air* instead of *water*. It is very much better for butter-making to cool milk with cold air than to cool it with cold water. When milk becomes colder than the air in the room in which it stands, as is the case when cooled with ice or cold water, it tends by its greater coldness to condense, and take in vapor from the surrounding air, with whatever of impurities that air may contain. But when the air is colder than the milk, the air becomes the recipient, and takes up and holds whatever exhalations may arise from the milk, and hence tends to deodorize it. It must be apparent that it would make a wide difference in the quality of butter, whether, while the cream is rising, the milk is cleansing the air, or the air cleansing the milk. In cooling with cold water or with cold air, this difference is made, and it is the principal reason why creamery butter keeps no better than it usually does.

Allow me to state another reason why it is better to set milk in cold air than in cold water. Cream rises better while the milk is losing heat, than it does after it has reached its bottom temperature, especially if that bottom temperature is a low one. This fact will require but little observation to verify, and yet dairymen and dairy writers have overlooked it. On this account, as well as for deodorizing, it is better that milk, when set for cream to rise, should cool slowly. Air being a poorer conductor of heat than water, allows of slow cooling, and thus aids in the perfecting of the cream.

Aware of these facts, I have been in the habit of advising dairymen who propose to use artificial means for cooling, to place an ice-room adjacent to the dairy, and cool by letting cold air into the room through a sub-ice duct. By connecting your sub-earth duct with a sub-ice duct as you propose, furnishes, it seems to me, the best means yet devised for cooling milk for butter-making. I saw a sub-earth duct last summer, attached to a creamery in Elgin, Ill., and though not put up as well as you would do it, it was quite efficient in bringing a stream of pure and cool air into the dairy.

Respectfully,

L. B. ARNOLD.

WILLARD'S "PRACTICAL BUTTER BOOK."

For the cuts, illustrating the "*Gulf Stream Refrigerated Dairy Room*," and the description, I am indebted to the "Rural Publishing House," 78 Duane Street, New York, publishers of the "PRACTICAL BUTTER BOOK," just out; from which valuable work they are extracted. No cow owner can afford to be without the "*Butter Book*."

It costs but one dollar, post paid, and is replete with the essential details of butter making — so long wanted.—AUTHOR.

J. H. REALL, Esq.,

OF

J. H. REALL & CO.

CHEESE AND BUTTER COMMISSION MERCHANTS,

No. 37 South Water Street,

PHILADELPHIA, PA.

IS THE AUTHORIZED GENERAL AGENT

For the sale of Rights for the use of the "*Patent Gulf Stream Refrigerated Dairy Room*," in all the States and Territories of the United States. Wherever Local Agents shall be appointed, Mr. Reall will be notified, and his agency discontinued in the districts assigned to said local agents.

Applications for agencies for the sale of rights will receive no attention unless they are accompanied by satisfactory references and a stamp. Experience has taught the necessity of this course.

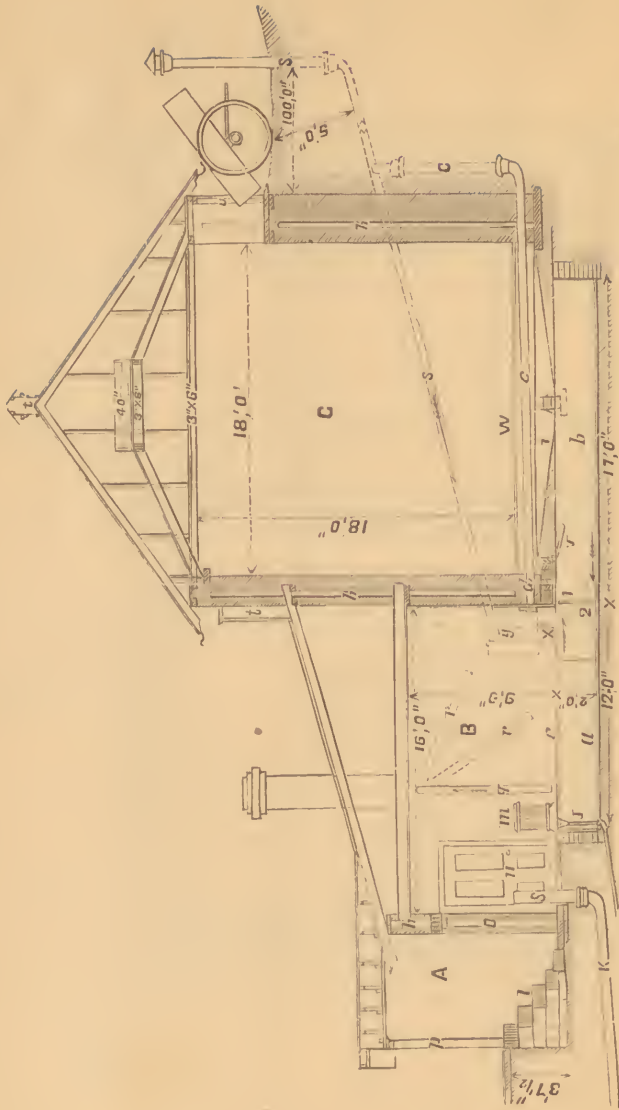


FIG. 2.—PLAN OF WILKINSON'S GULF STREAM DAIRY ROOM — LONGITUDINAL SECTION OF.

WILKINSON'S GULF STREAM REFRIGERATED DAIRY ROOM.

The most recent invention for regulating the temperature of the dairy is that of Prof. John Wilkinson, the well-known architect of Baltimore, Md., and the description of the plan and its operation will be of interest. The plan for a perfect control of temperature, and at the same time securing ample ventilation, meets a want which has long been unsupplied. Mr. W. has been granted letters patent on this invention.

This system of dairy-room construction has two distinctive characteristics, both operated by the same natural law, Gravitation. One consists in the displacement and circulation of air, and the other of water; the former for both cooling and ventilating the apartment; the latter for cooling only.

The device for conjunctive cooling and ventilating is very peculiar, unique, and both are strictly automatic in their action. It consists in constructing the building with hollow walls, or with close air chambers between the inner and outer walls; the windows are to have inner and outer sash, with confined air between them; and there are to be no places for the ingress or egress of air except those herein described.

All the air supplied to the apartment is admitted by natural movement through ducts, or pipes, laid in the ground at a depth to be secure from the effects of both sun and frost. One of said ducts requires to have a fall or slope toward the building, and the other from it; ordinarily, each duct requires to be about 100 feet in length and to be laid five feet below the surface of the ground.

THE ACTION OF THE DUCTS.

All the terminals of the ducts being open, air will circulate through both ducts and through the building at all times.

The direction of the air in the ducts depends entirely on the temperature of the external atmosphere. When said air is warmer than the earth, the cooler and more dense air in the ducts will, on account of its density, flow down into the building, thence through it and the lower duct, and will be discharged on the surface of the ground below the building. Thus it will be apparent that air is taken into the building at the temperature of the earth, or about 62 degrees. As the ducts are arranged in the diagram, if the temperature of the air in the building is higher than that of the air flowing through it, it will cool and change only the stratum near the floor.

If it is desirable to cool and change the air of the apartment to any particular point between the floor and the ceiling, it is only necessary to insert into the egress duct a joint of portable pipe of a length that will exhaust the air at the requisite height, when all the air below that point will be cooled and the circulation and ventilation will continue the same as before the perpendicular length of pipe was added.

REVERSING THE CIRCULATION.

Whenever the respective temperature of the external atmosphere and of that in the ducts is reversed, or when the out-of-door temperature is lower than that of the earth, heat will be absorbed by the air in the ducts from the earth in which they lie, and being rarified and rendered more buoyant, it will rise through the lower duct to the building, thence through it and the upper duct, and will escape at the highest point.

By this means circulation and ventilation is automatically maintained at all seasons, and thorough and constant change of the air of the apartment is secured; and, moreover, a uniform temperature is obtained summer and winter, without artificial heat, or the use of ice or cold water.

In warm weather, the duct being cooler than the external atmo-

sphere, a portion of the moisture in the air will condense on the interior surface of the duct, and when it increases to that degree that it flows in the pipe, it is received into drip wells, with earth bottoms, and is absorbed. The air, coming in contact with the moist surface of the duct, is effectually freed from dust and otherwise improved in its hygienic condition, which characteristic of the system can scarcely be over-estimated.

SALUBRITY SECURED.

A temperature most desirable in a dairy-room is objectionably low for the health and comfort of the manipulator, who is at times exposed to a sudden transition from a very high to a very low temperature, and *vice versa*. This serious objection is entirely removed in the proper use of the subterranean system of ventilation. The circulation of cooled air may be confined to a thin stratum near the floor, while all portions of the air of the apartment above that point may be kept at any temperature most desirable. No characteristic of this system is more highly estimated by persons familiar with hygienic laws than that last described.

A SUPER-COOLING DUCT.

Another characteristic of the system of subterranean ventilation, more highly prized by many than any other, is the powerful cooling adjunct, consisting simply of a branch of the summer-supply duct, which is laid in a cold air chamber, under an ice-house located contiguously to the dairy-room, or apartment to be cooled.

By closing a valve on the end of the direct, warm-weather supply duct, and opening that on the end of the super-cooling duct (both accessible in the apartment), all the air admitted must pass through the super-cooled branch duct, which may be made to supply air at the temperature of 40 degrees or lower; and by adjusting both valves, the temperature of the air admitted may be modified to any degree desired between forty and sixty.

The inventor, who is proverbial as a utilitarian, claims that to secure super-cooling, as above described, necessarily involves the use of more or less ice, and a proportionate expense, and that there

is in ice-houses, as ordinarily arranged, a waste of cooling power that he has saved in his "Gulf Stream" water bath, and by utilizing said waste he avoids unnecessary draught on the ice, and at the same time secures a more rapid system of cooling, when it is desired. Both systems are covered by the patent, hence he supplies both, and they may be used separately or conjunctively, as may be preferred.

The accompanying engravings are copied from drawings furnished by the inventor, and the reference descriptions are prepared by him :

Fig. 1 represents a ground-floor plan of the "Gulf Stream Refrigerated Dairy-room," with an ice-house contiguous.

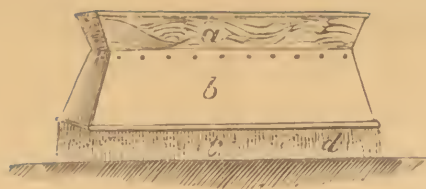
REFERENCES.

A, stairs leading to scullery, D ; B, the dairy-room ; C, the floor of the ice-house, on which the ice rests ; *a*, that portion of the Gulf Stream, water bath of which is in the floor of the dairy ; *b*, the portion of the bath which is in a cold air chamber, beneath the ice, and the bounds of it are denoted by the figures 1, 2, 3 and 4 ; the dimension figures denote the superficies of the bath. A row of cans in the bath is shown by the circles, and one can, marked 5, is set to receive strained milk from the straining can, 6. By using cans eight inches in diameter and twenty inches in depth, the capacity of the bath is 500 gallons ; *c*, the super-cooled branch of the summer supply duct, with a valve at *d* ; *e*, the main summer supply duct, with its drip well *f*, its perpendicular part *g*, and its valve at X ; *h*, air spaces in walls ; *i*, cold air chamber ; J, overflow of water bath ; K, summer egress duct, opening perpendicularly at the floor ; *l*, steam generator ; *m*, radiator for heating dairy ; *n*, chimney ; *o*, sink ; *p*, churn ; *q*, adjustable metal ventilating pipe, to be used as an exhaust, or egress pipe, if the peculiarities of the site require it ; *r*, work table ; S, rain water cistern. The walls represent brick and stones, the narrowest $4\frac{1}{2}$ inches ; the medium, 9 inch bricks, and the widest an $\frac{7}{8}$ eighteen inch stone wall. The building may, however, be built of any material most economical. As the cold water bath will not be required in winter, it may be

floored over with movable floor, and the same space be used for setting the milk in air. It will be seen that all the manipulation of the milk and butter, except setting for raising cream, is performed in the scullery. The joists shown in the ice-house floor are to be 3x12, and the plank of said floor are to be 2 inches in thickness. The floor of the cold air chamber is to be of cement, plastered on the earth; the object being to make it impervious to water, and it having a suitable drip, discharges the water from the melted ice into the water bath, and is its only source of supply.

Fig. 2 represents a longitudinal section of the entrance and stairway, A; the dairy-room, B; and the ice-house, C; *a*, that portion of the water bath in the floor of the dairy, and *b*, an extension of the same into the cold chamber under the ice; *c*, the super-cooling branch of summer supply duct, with its valve *d*; *e*, the floor of the dairy; *h*, the air chambers in walls; *i*, the cold air chamber under ice; K, the duct having a fall or slope from the dairy-room, which duct is the egress duct in summer; *l*, the stone steps; *m*, a radiator for heating the dairy; *n*, door between the dairy and scullery; *o*, doorway to scullery, and *p* the outer door; *q*, an adjustable ventilating pipe, connecting with the smoke flue. This pipe, in the position shown, exhausts the air from the dairy from a point near the floor, but in case it is desirable to exhaust it from a higher point the pipe may be turned to positions shown by *r*; *s*, shows the position of the main summer supply duct; *t*, ventilators on roof of dairy, and on that of ice-house; *u*, door for filling ice-house; *v*, a floating hinged valve, which rises and falls with the water in the bath, and prevents air from flowing from cold chamber into dairy-room. W, floor of ice-house; X, valve on discharge end of main supply duct branch, leading from the drip well *y*. 1, is a rocking valve in an erect position, so arranged that it forms a partition across the water bath, and prevents the circulation of the water, as it would circulate without said valve, on the Gulf Stream principle. When it is desirable to have water circulate for cooling the bath in the dairy, the valve is set obliquely, as shown by 2, and the colder water from under the cold chamber will flow along the bottom of the bath, in the direction shown by the lower arrow, and the warmer water from within the dairy will flow

into the cold chamber, as shown by the upper arrow. The circulation is checked and controlled by adjusting the valve, and the temperature of the water in the dairy is automatically maintained at any desired degree. The difference in the density of the water under the cold chamber, and of that in the bath in the dairy, causes a tendency to circulate until an equilibrium is established, but the equilibrium temperature would be too low for setting milk, hence the necessity for the valve for controlling the circulation, which may be done with the greatest nicety. It will be seen that there is a sub-roof, or raised ceiling over the ice. On this the non-conducting material is to be placed instead of putting it directly on the ice. The hollow walls serve as sufficient protection to the sides of the ice-house. With this arrangement, the labor and cost of material used in protecting the ice from heat has to be borne but once, instead of annually — no small item of economy.



WILKINSON'S WIND SCREEN,

PATENTED JUNE 24, 1874,

BY

J. WILKINSON, Baltimore, Md.

In the above illustration "a" represents a seed hopper, or box: "b" the canvass screen, surrounding and tacked to the box; and "c" the falling seed, or other substance sown. The screen is equally useful on seeding and fertilizer distributing machines. It is light, durable and inexpensive, costing but five dollars, and is thoroughly efficient in protecting substances sown with machines from the action of wind, the advantages of which are so apparent and so great that an enumeration of them would be a reflection on the intelligence of farmers.

It may be obtained of the patentee by sending with the order the money, and the length of one side and one end of the box, and the distance from the ground up to the point of attachment on said box, say one inch above the bottom.

The General Agent for the "FARMER'S FAVORITE" GRAIN DRILL, (manufactured by Bickford & Huffman, Macedon, N. Y.,) Col. H. P. Underhill, 64 South Sharp Street, Baltimore, is putting them on the grass seed attachment sold with the drill, also on that sold by him with the Wisner Sulky Rake. He has the general agency for the Wind Screens.

The patentee is prepared to manufacture them for all manufacturers and venders of seeding and fertilizer distributing machines.

Parties preferring so to do, may manufacture the Screen, and sell it with their machines for a moderate royalty.

It gives perfect satisfaction, and often saves its cost in seeding or fertilizing a few acres

ADVERTISEMENT AND NOTICE TO CORRESPONDENTS.

The office of the author will be in the Agricultural Building, Centennial Exhibition, from February 1st to the 10th of November, 1876.

This treatise will be sent to order for twenty-five cents; the Prize Essay on "*Dairy Room Construction and Dairy Farming*," for fifty cents; and Willard's "*Practical Butter Book*" for one dollar, all post-paid.

The latter may be obtained direct from the "Rural Publishing House," 78 Duane Street, New York; for the others, address the author.

Patent Rights for the use of the GULF STREAM REFRIGERATED DAIRY ROOM :

For a right for a Dairy, Cheese Factory or Creamery, . . .	\$20 00
For ordinary plans and full specifications for construction, . . .	25 00
Total,	<u>\$45 00</u>

No rights will be sold unless plans accompany the deed, lest the construction may not be in accordance with the principles involved.

BUSINESS CARD OF THE AUTHOR.

J. WILKINSON, Baltimore, Md., will promptly furnish Plans and Specifications for every variety of *Farm Building*, embracing every feature of convenience, durability, economy, adaptability and sightliness, that can be furnished for the sum to be expended.

He has recently invented *new and cheap modes of construction* for Cheap Cottages and Suburban Dwellings, that are very popular.

His *Patent Horse Stall* has no peer in this or any other country.

The dates of issue of the Patents on Dairies, etc., herein described, are respectively :

On Wind Screen,	June 2, 1874.
On Cooling Dairies,	May 5, 1874.
On Gulf Stream Dairy,	Jan. 26, 1875.

